

Short Communication

Length–weight relationships for three species of mudskippers (Gobiiformes: Gobionellidae) in the coastal areas of the Persian Gulf and Gulf of Oman, Iran

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Abstract: Length-weight relationships were estimated for three gobiid species of Iran. Significant length-weight relationships with high correlation coefficient were found for all species from eight localities. The value of the parameter b varied between 2.196–2.498 for *Boleophthalmus dussumieri* (Valenciennes, 1837); 2.554 to 3.460 for *Periophthalmus waltoni* (Koumans, 1955) and 2.316 to 2.920 for *Scartelaos tenuis* (Day, 1876).

Keywords: *Boleophthalmus dussumieri*, *Periophthalmus waltoni*, *Scartelaos tenuis*, Persian Gulf.

Introduction

Length-weight relationships (LWRs) of fishes which are crucial in the fisheries biology and stock assessments, estimate the fish's average weight with a given length category using mathematical equations. LWRs of fishes were originally used to provide information on the condition of fish and determine whether somatic growth was isometric or allometric (Le Cren 1951; Ricker 1975). This relationship was used for comparison of species growth between different regions (Koutrakis & Tsikliras 2003).

Length–weight relationships were reported for some marine and freshwater fishes of Iran (Hosseini 2002; Naddafi et al. 2002; Tabiee & Abdoli 2005; Esmaeili & Ebrahimi 2006; Abdoli et al. 2009; Heydarnejad 2009; Golzarianpour et al. 2011; Esmaeili et al. 2014). In this study, the parameters of LWRs are presented for three mudskipper species, *Periophthalmus waltoni* (Koumans 1955); *Boleophthalmus dussumieri* (Valenciennes 1837) and *Scartelaos tenuis* (Day 1876) (gobionelline-like gobiids, see Agorreta et al. 2013 for taxonomic

position of gobiid fishes) caught in coastal waters of the Persian Gulf, and Sea of Oman, Iran.

Materials and methods

The fishes were collected using hand net from eight localities in the Persian Gulf and Sea of Oman. The collected specimens were preserved in 10% formalin solution and then identified following Murdy (1989). Specimens then were measured to the nearest 0.01 mm total length (TL), using a Vernier caliper and weighed to the nearest 0.01 g (total weight, TW). The parameters of the length–weight relationship $W=aL^b$ were estimated by linear regression of the log-transformed weight and length (Koutrakis & Tsikliras 2003). Prior to regression analysis, log–log plots of length and weight values were performed for visual inspection of outliers (Froese 2006). Length–weight data were analyzed using SPSS 16.0 (SPSS Inc., Chicago).

Results and Discussion

Descriptive statistics and estimated parameters of LWRs for three fish species are presented in Table 1.

Table 1. Descriptive statistics and parameters of LWR for three species of mudskippers from the Persian Gulf and Gulf of Oman.

Species	N	Locality	Coordinates	Area	TL range (cm)	W range (g)	<i>a</i>	95% CI of <i>a</i>	<i>b</i>	95% CI of <i>b</i>	<i>r</i> ²
<i>P. waltoni</i>	37	Mahshahr	30°28'N 49°10'E	P. G.	8.82-12.46	6.81-19.72	0.0157	0.0094- 0.0262	2.816	2.602- 3.030	.953
<i>P. waltoni</i>	47	Helleh	29°14'N 50°40'E	P. G.	7.77-12.15	4.30-15.58	0.0135	0.0104- 0.0175	2.840	2.728- 2.952	.983
<i>P. waltoni</i>	38	Khamir	26°58'N 55°37'E	P. G.	7.49-11.49	4.52-15.27	0.0126	0.0091- 0.0174	2.903	2.761- 3.044	.980
<i>P. waltoni</i>	19	Qeshm (e.)	26°58'N 56° 4'E	P. G.	6.39-16.09	2.06-35.30	0.0070	0.0048- 0.0104	3.057	2.893- 3.221	.989
<i>P. waltoni</i>	6	Jask	25°40'N 57°48'E	G. O.	7.31-10.29	3.20-8.55	0.0082	0.0030- 0.0223	3.007	2.554- 3.460	.988
<i>P. waltoni</i>	29	Sourgalm	25°33'N 58°10'E	G. O.	5.91-13.20	1.66-19.19	0.0078	0.0059- 0.0104	3.001	2.879- 3.123	.990
<i>P. waltoni</i>	43	Gwater	25°12'N 61°28'E	G. O.	9.12-14.74	6.65-26.83	0.0087	0.0059- 0.0128	3.003	2.852- 3.154	.975
<i>S. tenuis</i>	39	Helleh	29°14'N 50°40'E	P. G.	9.54-16.34	4.45-20.47	0.0092	0.0053- 0.0159	2.706	2.492- 2.920	.947
<i>S. tenuis</i>	39	Qeshm (w.)	26°41'N 55°28'E	P. G.	7.53-14.83	2.60-13.38	0.0173	0.0124- 0.0239	2.469	2.329- 2.608	.972
<i>S. tenuis</i>	37	Qeshm (e.)	26°58'N 56° 4'E	P. G.	8.25-13.65	2.87-10.15	0.0147	0.0107- 0.0201	2.503	2.370- 2.636	.977
<i>S. tenuis</i>	45	Jask	25°40'N 57°48'E	G. O.	6.71-13.40	1.28-8.82	0.0129	0.0092- 0.0180	2.467	2.316- 2.619	.962
<i>B. dussumieri</i>	86	Helleh	29°14'N 50°40'E	P. G.	12.26-22.50	11.55-56.04	0.0373	0.0253- 0.0549	2.330	2.196- 2.464	.934
<i>B. dussumieri</i>	8	Qeshm (e.)	26°58'N 56° 4'E	P. G.	7.16-11.18	2.49-7.38	0.0238	0.0179- 0.0315	2.369	2.240- 2.498	.997

TL, Total length; W, weight; N, number of specimens; *a*, intercept; *b*, regression slope; *r*², coefficient of determination; P.G., Persian Gulf; G.O., Gulf of Oman.

A total of 473 fish samples were collected from eight localities in the Persian Gulf and Gulf of Oman. All LWRs were significant for these species ($P < 0.001$), with *r*² values greater than 0.91. Using combined sexes and small sample size may affect *r* values. The value of parameter *b* ranged from 2.196 for *B. dussumieri* (Helleh, Persian Gulf) to 3.460 for *P. waltoni* (Jask, Sea of Oman) which remain within the expected range of 2-4 reported by Tesch (1971) and approximately to $2.5 < b < 3.5$ reported by Froese (2006). However, some deviations from $b=3$ seem to stem from small size ranges (Table 1) which may be due to unavailability of all length classes. Abdoli et al. (2009) have reported $b=2.10-2.34$, $b=2.86$ and $b=2.50-2.56$ for *B. dussumieri*, *P. waltoni*, and *S. tenuis*, respectively, from the Persian Gulf. However, we report *b* values more than 3 for *P. waltoni* from Gulf of Oman. The variations

may be due to habitat condition, season, size and age differences and stage of fish maturations which have been already reported for different fishes (Tesch 1971; Esmaeili 2001; Froese 2006). Different physio-chemical conditions of the Persian Gulf from Gulf of Oman (Randall 1995) may affect LWR of studied populations. The fish for this study were collected from a wider area than that by Abdoli et al. (2009). For more precise weight estimation, the application of these LWRs should therefore be restricted to the observed length ranges.

The length–weight relationship in fishes is affected by a number of factors including season, habitat, population, gonad maturity, sex, diet, stomach fullness, health, sample size, preservation techniques and locality (Tesch 1971; Esmaeili 2001; Froese 2006) which some of these factors were not considered in the present study and differences in

LWR could potentially be attributed to the combination of one or more of the factors given above. However, the guidelines for data collection and analysis of weight–length relationships suggested by Froese (2006) are highly recommended in estimation of LWRs.

Acknowledgements

We wish to thank B. Souzansaz, and A. Asoubar for their help in sampling trips and measurements and the staff of Helleh protected area, Environment Department of Bushehr and Hormuzgan provinces for providing permission to collect the fish. This study was financially supported by Shiraz University and Ferdowsi University of Mashhad.

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